

signal corresponding to a particular path; and

(e) processing said signals in accordance with modeling techniques to determine qualitative or quantitative characteristics of the material.

57. The process of claim 56 wherein said central detection aperture consists of optical connections within said central detection aperture.

58. The process of claim 57 wherein said optical connections within said central aperture comprises of fiber optics.

59. The process of claim 57 wherein said distribution of substantially equidistant illumination means comprises a circular distribution of illumination means.

60. The process of claim 57 wherein substantially equidistant illumination means comprise fiber optics.

61. The process of claim 59 wherein substantially equidistant illumination means comprise fiber optics.

62. The process of claim 61 wherein said fiber optics within each circular distribution of illumination means are within individual ring apertures surrounding a central detection aperture and are present within an aperture which is sloped towards said central detection aperture.

63. The process of claim 57 wherein fiber optics within individual ring apertures surrounding a central detection aperture are within apertures which are concentrically spaced around said central detection aperture.

64. The process of claim 61 wherein said fiber optics within individual ring apertures surrounding a central detection aperture are present within an aperture which is sloped towards said central detection aperture.

65. Apparatus for improving optical interactance, transmittance and reflectance measurements comprising:

(a) a probe comprising a body portion and a contacting portion;

(b) said contacting portion comprising:

(i) a central detection area comprising at least one optical connection to a detection system; and

(ii) at least two outer illumination areas, each outer illumination area being connected to illumination means;

(c) said at least two outer illumination areas being optically connected to at least one source of illumination which can provide different signals at the same time or in rapid sequence to each of said at least two outer illumination areas;

(d) said at least two outer illumination areas and said central detection area forming at least two different paths of illumination between said at least two illumination areas and said central detection area, said different paths of illumination each comprising a distribution of substantially equidistant illumination means surrounding said central detection area.

66. The apparatus of claim 65 wherein said central detection area consists of optical connections to a detector system.

67. The apparatus of claim 66 wherein said optical connection of said central detection area to said detection system comprises fiber optics.